TECHNICAL NOTES

LAKE STATES FOREST EXPERIMENT STATION
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Design of an Experimental Sheet Metal Charcoal Kiln

The market for charcoal, particularly for domestic barbecuing, has been increasing steadily for several years. During the past 2 years, demand has exceeded supply in many localities during the summer months.

Most of the large-scale producers make charcoal in large steel ovens or retorts designed to recover wood distillation products. In addition, a considerable amount of charcoal is produced in kilns.

Charcoal kilns vary widely in size and design from conical metal units of only ½-cord capacity to brick "beehive" kilns with a capacity of 40 or more cords of wood. Kiln charcoal is produced by carbonizing wood through incomplete combustion. Kilns are relatively inexpensive compared to ovens or retorts. Consequently, production of kiln charcoal currently is expanding and new kiln operations are being established.

To meet an increasing demand for information on kiln design, operation, and raw materials, the Lake States Station is conducting research at several locations. This report describes an experimental sheet metal kiln which has shown some promise as an economical and serviceable unit.

The essential design features of this sheet metal kiln are shown in figure 1 (on back of sheet). Preliminary burns to test structure performance under severe conditions of temperature indicate that the basic features of this design are sound. The unit can be modified to meet a variety of specific requirements such as increased kiln capacity, rearrangement of vents, firing method, and type of door. The design features that appear most desirable and important are as follows:

Double walls with an intervening space for insulation and sand.--The insulation reduces radiation losses, thereby conserving heat for carbonization, reducing burning cycle time, and providing more uniform kiln temperatures. The sand provides an air seal, which is essential during the cooling portion of the cycle and facilitates temperature control during the carbonization period.

Insulation of kiln floor, door, and ceiling.--This provides the same advantages described above for walls.

Kiln ceiling supported independently of side walls.--Highest temperatures generally occur at ceiling level, and structural failures may result if the ceiling is not adequately supported and the bearing load removed from side walls.

Protection of kiln walls from heat and from rapid oxidation at air intake ports and kindling area.

Relatively low cost of structure.--Kiln can be constructed from locally available materials and without highly skilled labor. Cost of materials for this 3-cord kiln was approximately $450.

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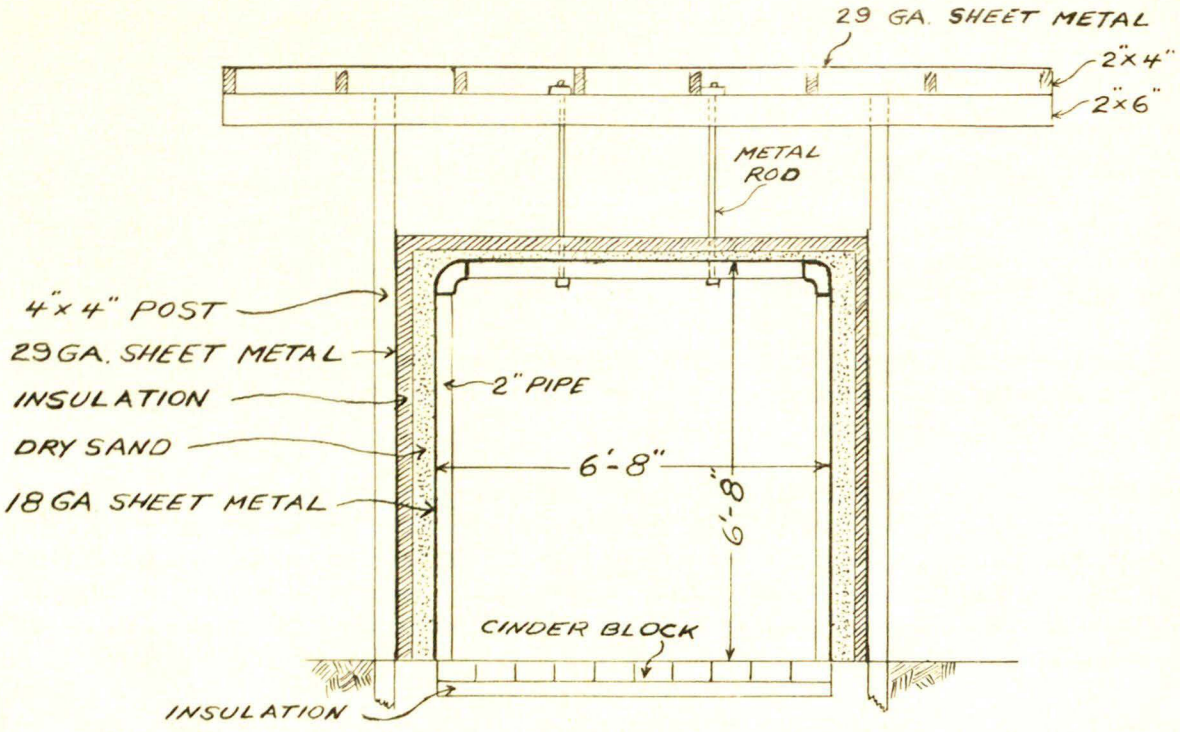

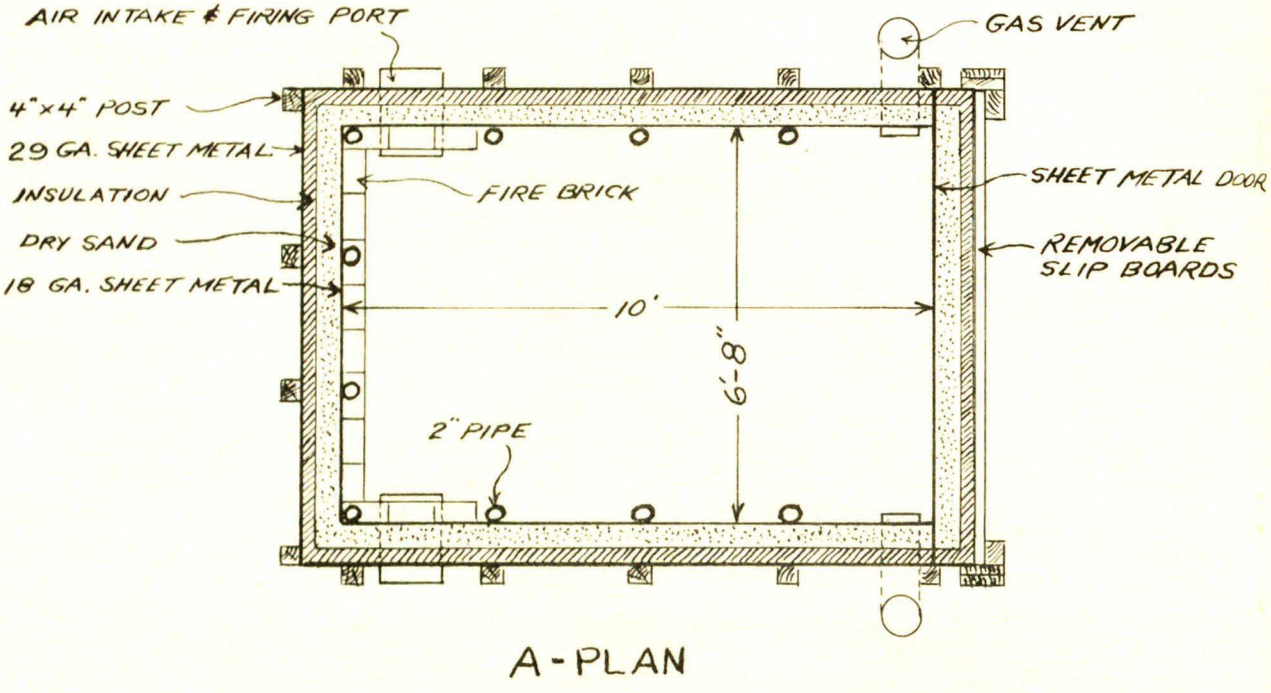

FIGURE 1. Schematic drawing showing essential features of a $3\frac{1}{2}$-cord experimental charcoal kiln. (A) Floor plan. (B) Cross section.